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THEORETICAL RESEARCH

Study on Traditional Chinese Medicine theory of lung being connected with large intestine

Ping Liu, Ping Wang, Daizhi Tian, Junfeng Liu, Gang Chen, Songlin Liu

Ping Liu, Ping Wang, Daizhi Tian, Junfeng Liu, Gang Chen, Songlin Liu, Key Laboratory of Traditional Chinese Medicine Resource and Compound Prescription, Hubei College of Traditional Chinese Medicine, Ministry of Education, Hubei, Wuhan 430065, China
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Correspondence to: Prof. Ping Wang, Key Laboratory of Senile Dementia (Xing Nao Yi Zhi), State Administration of Traditional Chinese Medicine of the People's Republic of China, Hubei, Wuhan 430065, China. pwang54@yahoo.com.cn
Telephone: +86-027-63718725
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Abstract

OBJECTIVE: The theory of lung being connected with large intestine, which is a major topic in Traditional Chinese Medicine (TCM), has guided clinical practice for thousands of years in China.

METHODS: In this study, we analyzed the history, main contents, clinical application, and material basis of the theory, to attempt to improve the potential clinical significance of "lung being connected with large intestine" in China.

RESULTS: The lung being connected with large intestine was first described in "Huang Di Nei Jing", and formed one of the basic theories of TCM. For thousands of years, the majority of TCM practitioners explored this theory continuously, leading to its development and use as an important theory in the guidance of TCM clinics In the last decade, researchers in the field of integrated TCM and Western medicine have studied clinical applications and biomedical mechanisms with experimental methods to explore the implications of the theory.

CONCLUSION: With the further development of science and technology, research concerning the theory of lung being connected with large intestine will be greatly stimulated and contribute to the modernization of TCM.

Key words: Lung being connected with large intestine; Traditional Chinese Medicine; Clinical application

INTRODUCTION

Over the course of many centuries, Traditional Chinese Medicine (TCM) has formed a unique theoretical base, and diagnostic treatment techniques. The lung being connected with large intestine, is one of the most important theories of TCM, which considers the human body to be a united whole. The theory posits that the lung and the large intestine are in physical contact and pathologically interact.[1] In China, the theory has guided clinical practice for thousands of years and shown positive clinical efficacy.[2-6] Research has shown that although the mechanism of the relationship between the lung and large intestine has not been completely elucidated, the theory has been fully accepted.[7]

In the last decade, researchers in the field of integrated TCM and Western medicine have conducted comprehensive in-depth studies of this theory.[8,9] The studies included literature research, clinical studies, molecular biology, immunology, embryology, endocrinology, bowel

diseases influencing the lung, and pulmonary diseases influencing the large intestine, and an effort has been made to try to explain the mechanism of how the large intestine and lung are related. In this study, we review the origin, clinical application, and mechanism of the theory of "lung being connected with large intestine".

THE ORIGIN AND MAIN CONTENTS OF THE THEORY

From the historical literature, it is has been shown that the theory of lung being connected with large intestine first appeared in the Qin (246-207 BC) and Han dynasties (206 BC-220AD), developed further in the Sui (581-618 AD) and Tang dynasties (618-907 AD), and advanced in the Song (960-1279 AD) and Yuan dynasties (1580-1368 AD), but was only perfected in the Ming (1368-1644 AD) and Qing dynasties (1644-1911 AD).

The earliest record of the theory comes from Huangdi Neijing (the Yellow Emperor's Canon of Internal Medicine), which is the "bible" for TCM and was first published over 2000 years ago.[10] For example, Ling Shu Ben Shu,[10] a chapter in Huangdi Neijing, was the first to mention the lung being connected with the large intestine. Then, Ling Shu Hai Lun,[10] another chapter in volume one of Huangdi Neijing, proposed that meridians connect with the viscera in the exterior, and link to the limbs in the exterior. The meridian theory posits that the Lung Meridian of Hand-Taiyin can connect with the Large Intestine Meridian of Hand-Yangming to form the interior-exterior relationship. It is considered that meridians can connect the inner organs, joints, and extremities, thus converting the whole body into one entire organ. Specifically, the pathways are as follows: the *Qi* of the lung connects the large intestine to meridians and vessels and transfers from the index finger, branching crevice behind the wrist, and collaterals of acupoint Pianli (LI 6) along the lung meridian into the large intestine meridian and then to the large intestine. Simultaneously, Large Intestine *Qi* can transfer from meridians and vessels into the lung and form the circulation. A divergent collateral of the lung meridian connects the large intestine meridian at the side of the neck and forms a circulation route, which extends from the hands to the head and is distributed over the heart.[11,12]

However, it is also important to note that in TCM, the names of the viscera of the human body are quite similar to those used in modern medicine, but many connotations differ between the two systems. Therefore, it is important to use the concepts of Zang-Fu organs to interpret the theory. According to TCM theory, the lung, including two lobes on the left and right, is situated in the thorax, communicates with the throat and opens into the nose, which is similar to the anatomical structure of the lung in Western medicine. The main physiological functions of the lung are to control *Qi* and respiration, govern dispersing and descending activities, and regulate the passage of water. The large intestine is located in the abdomen. Its upper end connects with the small intestine through the ileocecum and its lower end connects with the anus. The main function of the large intestine is to receive the waste content of food transmitted down from the small intestine, absorb part of the liquid from waste, and transform the rest into feces to be discharged from the anus, which is similar to the function of large intestine in Western medicine.[13,14]

Studies have shown that in pathological conditions, there are reciprocal affects between the lung and the large intestine.[15,16] For instance, dysfunction of the lung can lead to constipation. When body fluid is low because of excessive heat in the lung, the large intestine can have trouble performing movements, and, in consequence constipation can occur. In TCM the author of Su Wen writes "cough incessantly is suffered from dysfunction of large intestine".[17] Furthermore, large intestine dysfunction can result in pulmonary dysfunction. For example, dysfunction of the large intestine may cause asthma.[18,19] In TCM the author of Lin Shu writes "Abdominal singing, *Qi* punching upward to chest, and too puff to stand long, all lie in the evil of large intestine."[20]

On this basis, ancient physicians promoted the theory continuously. For example, Zhang Jingyue, a distinguished physician of the Ming Dynasty (1563-1640 AD), presented in Complete Works of Zhang Jingyue; the occurrence of pulmonary disease was associated with decreased water consumption and the formation of saliva and phlegm, which could indirectly induce the decrease of fluids in the large intestine.[21] Similarly, when the large intestine has a disorder of *Qi* movement, it not only affects the movement of Lung *Qi*, but also the distribution and excretion of body fluids in the lung.

THE MAIN CLINICAL APPLICATION OF THE THEORY IN CHINA

The theory of lung being connected with large intestine has had a long history of clinical application. For thousands of years, TCM doctors continuously explored the theory and showed that the theory has important clinical value. It has been demonstrated that the significance of the relationship between the lung and large intestine is not only in the explanation of their physiological functions, but also for guiding clinical practice.[22] Therefore, therapeutic principles including "regulating the intestine function to treat lung diseases", "regulating the lung function to treat intestine diseases", and "regulating lung and large intestine simultaneously" are often used in current clinical practice.[23]

At present, it has been shown that treatment of intesti-

nal disease can help treat lung diseases such as asthma, bronchitis, pneumonia, pleural effusion, pulmonary heart disease, adult respiratory distress syndrome (ARDS), chronic obstructive pulmonary disease (COPD), and others.[24-26] In addition, it has also been found that treatment of disorders of the lung can aid in treatment of large intestinal disorders such as constipation, colitis, irritable bowel syndrome (IBS), inflammatory bowel disease (IBD), and others.[27-29]

Thus far, available research has shown that the mechanism of this reciprocal treatment relationship includes the promotion of intestinal movement, decreases in abdominal pressure, direct improvement of patients' respiratory function, the excretion of various intestinally toxic substances, and an improvement in the microcirculation metabolism.[30]

Based on the facts above, we searched the clinical literature published from 2008 to 2010, using the following keywords: cold; cough; asthma; hemoptysis; pulmonary abscess; consumptive lung disease; phthisis; pneumonia; lung distension; bronchitis; pneumocardial disease; emphysema; constipation; diarrhea; abdominalgia; and enteritis to analyze the frequency of lung symptoms coincident with intestinal diseases, and vice versa. A total of 817 relevant articles were retrieved from the China Knowledge Resource Integrated database (CNKI), Chongqing VIP Information (CQVIP) database, and the MEDLINE database. The 817 articles included 499 articles describing symptoms of intestinal diseases coincident with diseases of the lung, and 318 articles describing symptoms of lung diseases coincident with intestinal disorders. From the search conducted it was clear that both TCM and Western medicine recognized the phenomenon of the lung being pathologically related to the intestine.

From the research above, it was found that in addition to the primary symptoms of lung and intestinal diseases, such as cough and asthma in the lung, and constipation and diarrhea in the intestines, symptoms of intestinal diseases secondary to lung diseases such as constipation, diarrhea, blood in stool, belching, and abdominal pain were observed (Table 1). Additionally, symptoms of lung diseases secondary to intestinal diseases such as coughing, breathlessness, sputum, hemoptysis, and other pulmonary symptoms were also observed (Table 2). These results show that it is necessary to consider the relationship between the lung and the intestine in the treatment of lung and intestinal diseases.

THE THEORY FROM THE MODERN MEDICINE POINT OF VIEW

In recent years, studies have probed the relationship between the lung and the large intestine from different angles and aspects. It has been reported that the material base of the theory may include body structure, endocrine material, chemokines and proinflammatory mediators, mucosal immunity, gas excretion, and endotoxins.[31,32]

Body structure

Some studies have suggested that according to the biological process of embryogenesis, most organs of the respiratory system and digestive system originate from the embryonic digestive tube. This common origin of embryonic development, laid the phylogenic foundation for the inner link between the lung and the large intestine.[33] It may be that the common origin of embryonic development formed the structural basis of the theory.

Excretion pathway of intestinal gas

A study showed that intestinal gas is mainly absorbed in the circulation of the intestinal wall and is then exhaled from the lung, and may be up to 20 times the amount of gas expelled from the rectum. If the lungs fail to remove the gas from the circulation, because of pulmonary diseases such as pneumonia and bronchial asthma, it would adversely affect the excretion of gastrointestinal gas. Therefore, cathartic and purgative treatment may not only help intestinal function recover, but also lessen the burden of the lungs.[34]

Endotoxins in the intestine

It has been found that endotoxins in the intestine can accumulate and can be absorbed in the blood and cause damage to the lung. The endotoxins pass through the inferior vena cava to the right heart and flow into the pulmonary artery, and the first organ to be affected is the lung. Studies have also suggested that intestinal infection can increase the level of endotoxins and neutrophils in the lung and induce inflammatory responses. For these reasons, the level of endotoxin in the intestine can signal early lung damage.[35]

Immune systems of the mucosa of the gastrointestinal system and respiratory system

Gastrointestinal and respiratory system mucosa play roles in immunity. It is generally considered that immune networks are likely mediating the mechanism of the relationship between the lung and large intestine. Mucous of the gastrointestinal immune system is much more complicated than other immune systems. The total area of mucous in the human intestinal tract is approximately 300 square meters, and mediates communication between the internal and external environment. Localized problems are communicated through the mucous immune system, which allows large area interactions to take place. For example, research indicates that both the gastrointestinal and respiratory tracts have a similar structure of mucous and secrete salivary immunoglobulin A (sIgA), which is one of the important molecules of mucous immune system.[36,37] This suggests that sIgA signaling could allow the gastrointestinal and respiratory systems to interact with each other.

Neuroendocrine correlations

Studies have established that the lung is not merely a respiratory organ, but is also an endocrine organ. The release of vasoactive intestinal polypeptide (VIP) from the lung has a relaxation effect on the intestine. Conversely, it has been shown that there are many endocrine substances secreted by the intestine, such as calcitonin gene-related peptide, vasoactive intestinal peptide (VIP), and surfactant protein A (SP-A).[38,39]

Microecology

It is has been shown that microorganisms inhabit the surface of the mucous in the gastrointestinal and respiratory tracts. Enteric dysbacteriosis, induced by antibiotics, is an important risk factor in the occurrence and development of allergic asthma. Moreover, application of microecological modulating agents has been shown to inhibit the generation of gastrointestinal gas and intestinal endotoxins, promote the excretion of gas, and therefore lighten the burden of the lung in discharging gas, and thus indirectly improved microcirculatory and pulmonary function.[40]

Table 1 The frequency of symptoms of intestinal diseases coincident in pulmonary diseases

Lung disease	Intestinal symptoms					
	Constipation	Diarrhea	Blood in stool	Belching	Abdominal pain	Other symptoms
Cold	23	17	4	3	5	15
Cough	40	36	11	9	10	15
Asthma	46	43	9	18	12	19
Hemoptysis	19	14	2	3	11	15
Epistaxis	14	13	6	4	10	13
Consumptive lung disease	23	18	10	12	14	16
Suppurative lung disease	21	13	8	4	10	13
Phthisis	12	20	7	6	15	12
Lung distension	18	22	3	16	9	13
Pneumonia	23	26	12	15	12	14
Emphysema	32	38	8	20	11	28
Other disease of lung	31	30	17	17	27	40

Table 2 The frequency of symptoms of pulmonary diseases coincident in intestinal diseases

Intestinal disease	Pulmonary symptoms					
	Cough	Dyspnea and tachypnea	Expectoration	Hemoptysis	Sweating, short of breath	Other symptoms
Constipation	31	31	21	17	12	18
Blood in stool	13	9	17	7	12	14
Diarrhea	19	18	4	9	21	13
Abdominal pain	18	15	11	17	13	15
Enteritis	12	14	9	8	6	11
Typhoid fever	6	4	10	4	5	10
Other disease of intestine	17	15	15	18	6	17

CONCLUSION

The study of the theory of lung being connected with large intestine has a long, rich history and is multi-directional. In the last decade, many studies on the theoretical meaning, biomedical mechanisms, and clinical application of the theory that the lung and the large intestine are interior-exteriorly linked have been made. Compared with modern medicine, studies in the field of TCM have paid increasing attention to the under-

standing of a disease as a whole from the view point of an interrelated and reciprocal relationship between the lung and the large intestine. In the present review, we analyzed the theoretical origin, clinical application, and material basis of the relationship between the large intestine and the lung, to better explore the TCM interpretation of the theory. However, it is difficult to obtain a complete understanding of the theory over a short time period. Further research is needed to continue to reveal the biological foundations of the theory.

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